

WHAT IS CLAIMED IS:

1. Illumination system for scanning lithography with wavelengths \leq 193 nm, particularly EUV lithography, for the illumination of a slit, comprising
 - 1.1 a light source,
 - 1.2 at least one field mirror or one field lens,
 - 1.3 an image plane,characterized in that
 - 1.4 the field mirror(s) or the field lens(es) is (are) shaped so that the illuminated field is distorted in the image plane perpendicular to the scanning direction.
2. Illumination system pursuant to claim 1, characterized in that the field mirror(s) or the field lens(es) is (are) shaped so that a given intensity distribution of the illuminated field is achieved using the field mirror(s) or the field lens(es).
3. Illumination system pursuant to one of the claims 1 or 2, characterized in that the illumination intensity in the illuminated field varies along a direction which is perpendicular to the scanning direction.
4. Illumination system pursuant to Claims 3, characterized in that the illumination intensity decreases from the center of the field to the field edges.
5. Illumination system pursuant to Claims 3, characterized in that the illumination intensity increases from the center of the field to the field edges.

6. Illumination system pursuant to one of the claims 1 to 5, characterized in that the uniformity of the scanning energy in the image plane is in the range of $\pm 7\%$, preferably $\pm 5\%$, and very preferably $\pm 3\%$.
7. Illumination system pursuant to one of the claims 1 to 6, characterized in that the illumination system contains a aperture stop plane and the field mirror(s) or the field lens(es) is (are) shaped so that the aperture stop plane is imaged in a given exit pupil of the illumination system.
8. Illumination system pursuant to one of the claims 1 to 7, characterized in that the field mirror(s) or the field lens(es) is (are) shaped so that a given shaping of the illuminated field is achieved using the field mirror(s) or the field lens(es).
9. Illumination system pursuant to one of the claims 1 or 8, characterized in that the illuminated field is rectangular or a segment of a ring field.
10. Illumination system pursuant to one of the claims 1 to 9, characterized in that the field lens(es) or the field mirror(s) has (have) a toroidal design.
11. Illumination system pursuant to one of the claims 1 to 10, characterized in that the field mirror(s) is (are) grazing incidence mirror(s).
12. Illumination system pursuant to one of the claim 1 to 11, characterized in that optical components are provided for transforming the light source into secondary light sources.

13. Illumination system pursuant to Claim 12, characterized in that the optical components for the transformation comprise a first mirror that is divided into several single mirror elements.
14. Illumination system pursuant to Claim 13, characterized in that the mirror elements of the first mirror are field facets and the field facets are imaged into the image plane.
15. Illumination system pursuant to one of the claims 12 to 14, characterized in that the illumination system has a second mirror that is divided into several single mirror elements, wherein the mirror elements are located at the secondary light sources.
16. Illumination system pursuant to Claim 15, characterized in that the mirror elements of the second mirror are pupil facets and the field facets are imaged into the image plane using the pupil facets and the field mirror(s) or the field lens(es).
17. Illumination system pursuant to one of the claims 14 to 16, wherein the imaging of the field facets into the image plane can be divided into a radial imaging and an azimuthal imaging, characterized in that the azimuthal imaging is distorted.
18. Illumination system pursuant to claim 17, characterized in that the field mirror(s) or the field lens(es) is (are) shaped so that a given azimuthal distortion of the image formation of the field facets is achieved using the field mirror(s) or the field lens(es).

19. Illumination system pursuant to one of the claims 12 to 18, characterized in that the field mirror(s) or the field lens(es) are shaped so that the secondary light sources are imaged in a given exit pupil of the illumination system.
20. Illumination system pursuant to one of the claims 1 to 19, characterized in that the field mirror(s) include(s) actuators for active control of the mirror surface(s).
21. Illumination system pursuant to claim 20, characterized in that the distortion and thus the intensity distribution is modified in the illuminated field using the actuators.
22. Illumination system pursuant to one of the claims 20 or 21, characterized in that the directions of the centroid rays in the image plane are changed less than 5mrad, preferably less than 2mrad, and very preferably less than 1mrad, if the mirror surface(s) is (are) modified.
23. Illumination system pursuant to one of the claim 21 or 22, characterized in that the variation of the distortion is achieved by modifying only these surface parameters of the field mirror(s) which influence the shape of the surface(s) perpendicular to the scanning direction.
24. Illumination system pursuant to one of the claims 20 to 23, characterized in that the actuators are arranged in rows parallel to the scanning direction.
25. Projection exposure system for scanning-microlithography, with
- 25.1 a mask on a support system,
- 25.2 a projection objective to image the mask to an image plane,

- 25.3 a light-sensitive subject on a support system in the image plane of the projection objective, characterized in that
- 25.4 the projection exposure system comprises an illumination system pursuant to one of the claims 1 to 24, wherein the mask is located at the image plane of the illumination system.
26. Projection exposure system pursuant to claim 25, characterized in that the maximum deviation between the directions of the centroid rays and the chief rays of the projection objective in the mask plane is ± 10.0 mrad, preferably ± 4.0 mrad, very preferably ± 1.0 mrad.
27. Projection exposure system pursuant to one of the claims 25 or 26, characterized in that the uniformity of the scanning energy in the image plane of the projection objective is in the range of $\pm 7\%$, preferably $\pm 5\%$, and very preferably $\pm 3\%$.
28. A method for the static correction of scanning energy in an projection exposure system pursuant to one of the claims 25 to 27, comprising the following steps:
- 28.1 a predetermined distribution of scanning energy is provided in the slit to be illuminated,
- 28.2 the curve of the azimuthal magnification β_s is calculated to achieve the predetermined distribution of scanning energy,
- 28.3 the shape of the field mirror(s) or the field lens(es) is determined, with which the calculated curve of the azimuthal magnification β_s is achieved.

29. A method for the dynamic correction of scanning energy in an projection system pursuant to one of the claims 25 to 27, comprising the following steps:
- 29.1 the distribution of scanning energy $SE_w(x_w)$ is measured in the plane of the wafer,
- 29.2 the measured curve of scanning energy $SE_w(x_w)$ is compared with a predetermined distribution of scanning energy $SE_{STANDARD}(x_w)$,
- 29.3 if there is a difference, the appropriate actuators of the field mirror(s) are actuated until the measured distribution of scanning energy $SE_w(x_w)$ corresponds to the predetermined distribution $SE_{STANDARD}(x_w)$, so that a predetermined uniformity is achieved.
30. A method of producing microstructured devices by lithography making use of a projection exposure apparatus according to one of the claims 25 to 29.

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